Layer-averaged rain rate measurements using zenith pointing Ka-band radar based on attenuation method

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Accurate estimation of rain is crucial for numerous applications in hydrology (e.g., providing freshwater etc.), nowcasting (e.g., reducing the danger of flash floods and river flooding etc.), and mesoscale model validation. In this work, we used cloud radar operating at Ka-band (~35.29 GHz) to estimate rain rate. Traditionally, millimetre wavelength radar is not used to estimate rain due to attenuation by hydrometeor. However, the attenuation properties of Ka-band can be used to estimate layer-average rainfall rate. This method of rain retrieval is insensitive to absolute system calibration.

In this work, we estimate rain rate from zenith pointing Ka-band radar deployed at Mandhardev (18.04 ^{o}N, 73.87 ^{o}E, ~1.3 km AMSL), Western Ghats, India. First, we identified the height where the Ka-band radar signal starts attenuating. From that height we consider two layer thicknesses (0.5 km and 1 km) to retrieve rain. Comparison between Disdrometer-derived rainfall rates at the surface and radar retrievals are in good agreement with a correlation coefficient of ~0.73 (0.5 km thick layer) and ~0.75 (for 1 km thick layer). Better correlation coefficient for 1 km thick layer is due to the domination of attenuation as compared to 0.5 km thick layer. Error analysis is also performed. Details will be presented in the upcoming conference.